digitally steerable array

DSA250 & DSA230 LOUDSPEAKER
OWNER'S MANUAL

EAW

DSA Owner's Manual

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Introduction

The Digitally Steerable DSA Series Arrays represents EAW's latest innovation in advanced, acoustic modeling and applied technology in designing loudspeakers. The DSA250 full-range and DSA230 voice-only or low frequency system are small format, column-type loudspeaker systems with a user-variable vertical beamwidth. The easy-to-use DSAPilot software allows accurate adjustment of the loudspeaker's coverage area from a fixed, vertical mounting location. In addition to excellent vocal performance, the DSA Series is fully capable of full-range music applications. With integral signal processing and amplification, DSA loudspeakers are economical and simple to use.

This manual provides information about the design, configuration, and operation of DSA Series loudspeakers. It is intended to be used in conjunction with the DSAPilot Windows®-based software.

Please thoroughly familiarize yourself with this manual. The more you learn and understand about the DSA Series the easier you will find it to use. This is not so much because of any inherent complexities, but because it is actually easier to use than most. As such, it can take some experience with the system to establish comfort with and appreciation of both its versatility and inherent simplicity.

* * *

Chapter 1 Safety

1.1 Safety Precautions

The terms "Caution," "Warning," and "Danger" are used throughout this manual to alert the reader to important safety precautions. If you have any questions about any aspects of these precautions, contact your local dealer, distributor, or EAW. The following are the descriptions of the safety precautions.

CAUTION: describes an operating condition or user action that may expose the equipment or user to potential damage or danger.

WARNING: describes an operating condition or user action that will cause damage to the equipment or injure the user.

DANGER: describes an operating condition or user action that will immediately damage the equipment or be extremely dangerous or life threatening to the user.

1.2 Safety Instructions

CAUTION: To reduce the risk of electric shock, do not remove cover (or back). No user-serviceable parts inside. Refer servicing to qualified personnel.

WARNING: To reduce risk of fire or electric shock do not expose this appliance to rain or moisture.

The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

This apparatus does not exceed the Class A/Class B (whichever is applicable) limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

WARNING: Some aspects of installation, rigging, electrical power, and other fields related to using equipment, which EAW manufactures, sells, or distributes, are potentially hazardous. Any person using this equipment is personally responsible for his or her own safety. EAW transactions are made with the assumption that the purchaser is a qualified individual or will have only qualified individuals perform work with the equipment. EAW will not be liable for any damages arising from the use of equipment sold to purchaser.

DANGER: Only persons with the knowledge of proper hardware and installation techniques required should attempt to install DSA Series loudspeaker systems overhead. Failure to follow this precaution may result in damage to the equipment, injury, or death.

1.2.1 GENERAL PRECAUTIONS

1. Read and Follow Instructions — Before installing and operating this loudspeaker, read and follow all instructions and safety precautions in this manual and on the loudspeaker. Retain them for future reference.

2. Ventilation — The sides and rear of the enclosure form the heat sink for the internal amplifiers and may reach high temperatures during use. As such, adequate ventilation is required to ensure proper operation. Allow a minimum of 2 inches of clearance between the enclosure and adjacent surfaces so as not to impede the flow of air past the sides and rear surfaces. Also, locate the loudspeaker away from heat sources such as radiators or other devices that produce heat. If the enclosure is in a grille-covered recess, forced air ventilation may be required.

3. AC Mains — Connect this loudspeaker only to a nominal 115 V or 230 V AC Mains supply as described in this manual. Before applying AC power, ensure the AC Mains voltage rating on the loudspeaker matches the nominal AC Mains voltage being supplied: 115 V or 230 V, 50 Hz or 60 Hz.

   DANGER: DO NOT APPLY 230 V MAINS POWER IF THE VOLTAGE RATING ON THE LOUDSPEAKER IS 115 V. IMMEDIATE AND CATASTROPHIC DAMAGE TO THE LOUDSPEAKER WILL RESULT AND MAY CAUSE A FIRE HAZARD, SERIOUS PERSONAL INJURY, OR DEATH.

4. Object and Liquid Entry — Take care that objects do not fall into and liquids are not spilled into the loudspeaker.
5. Servicing — Do not attempt to service this loudspeaker. All service or repair should be referred to the EAW Service Department or your EAW Distributor.
6. Damage Requiring Service — Only qualified service personnel should service this loudspeaker if one or more of these conditions occur:
   A. The power-supply cord or the plug has been damaged.
   B. Objects have fallen, or liquid has spilled into the loudspeaker.
   C. The loudspeaker has been exposed to rain.
   D. The loudspeaker does not appear to operate normally or exhibits a marked change in performance.
   E. The loudspeaker has been dropped, or its chassis damaged.

7. Grounding or Polarization — Do not defeat the electrical grounding means provided for this loudspeaker.

Chapter 2 Unpacking

2.1 Contents

QTY	PART #	DESCRIPTION
(1)	0005483	DSA230 or
	0005480	DSA250 loudspeaker
(1)	0005901	Instruction Manual
(1)	0005854	1 ft Cat-5 Signal Link Cable RJ-45 to RJ-45 (wired as a crossover cable)
(1)	005085	Neutrik® PowerCon™ NAC3FA in-line plug
(3)	0005850	Phoenix Contact MSTB 2,5/3-STZ-5,08 3-pin in-line plug
(2)	0006118	Enclosure Bracket
(2)	102195	3/8-16 x 2 in Enclosure Bracket Bolt
(2)	102035	1/4-20 x 3 in Retainer Bolt
(2)	105011	3/8 in Lockwasher
(2)	105004	1/4 in Lockwasher
(2)	0006119	Wall Bracket
(1)	0006103	DSA CD-ROM containing DSAPilot and other documentation
(1)	RD0084	DSA230 or
	RD0085	DSA250 Wall Bracket Mounting Template (Printed on Shipping-Carton)

2.2 Shipping Damage

After unpacking, if the loudspeaker is found to have shipping damage, save the packing materials for the carrier's inspection, notify the carrier immediately, and file a shipping damage claim.

Although EAW will help in any way possible, it is always the responsibility of the receiving party to file any shipping damage claim. The carrier will help prepare and file this claim.

2.3 Returning Products to EAW

If the loudspeaker must be returned to EAW, contact the EAW Service Department for a Return Authorization (See Chapter 7). Use the original shipping carton and packing materials. If the shipping carton is lost or damaged, contact EAW for a new carton, for which there will be a small charge. EAW will not be responsible for damage caused by inadequate packing when returning the loudspeaker for service.

All units returned must have a factory return authorization number. Any units received without an Return Authorization Number assigned and written prominently on the outside of the carton will be refused.

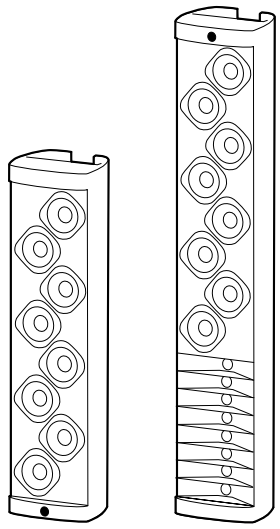


Figure 3.1 DSA230 & DSA250

Chapter 3 Quick Start

This section provides basic installation requirements. Refer to Chapter 5 for detailed instructions.

Loudspeaker refers to either a DSA230 or DSA250.

Cluster refers to any of the permissible arrangements of single or multiple DSA230s or DSA250s as defined in DSAPilot. Whether they consist of a single or multiple loudspeakers, all DSA clusters function as a single loudspeaker.

3.1 Description

The EAW DSA Series loudspeakers are variable directivity, self-powered line arrays. EAW's easy-to-use DSAPilot provides computer control for the loudspeaker's vertical beamwidth pattern. This allows customizing the coverage on-site to fit the application. Loudspeakers are controlled via standard EIA-485* or optional CobraNet™/Ethernet networking.
*Also known as RS-485 (Recommended Standard 485)

Model DSA250 is a full range loudspeaker. Model DSA230 can be employed as a voice-only loudspeaker or as low frequency loudspeaker to supplement a DSA250's low frequency output and pattern control.

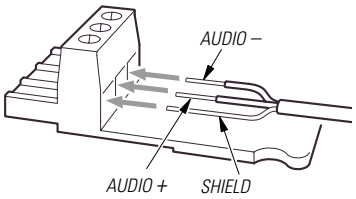


Figure 3.2 Audio Connector

3.2 Audio Signal Connection

NOTE: Using the DSAPilot, the two input channels may be summed to mono, used separately, or set up for a priority override function: Audio B overrides Audio A. Equalization, compression, and level are separately adjustable for each input. Overall signal delay for each loudspeaker cluster is also provided.

Audio A and B (each): *2-conductor shielded audio cable/supplied*
Phoenix Contact terminal block plug

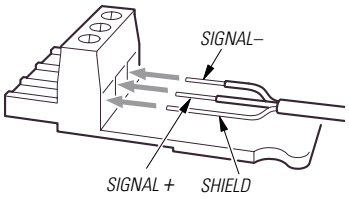


Figure 3.3 EIA-485 Connector

3.3 Computer Control Connection

NOTE: Set the EIA-485 Terminate Switch to "ON". For multiple loudspeakers, see Chapter 5.

EIA-485: *2-conductor shielded audio cable/supplied*
Phoenix Contact terminal block plug

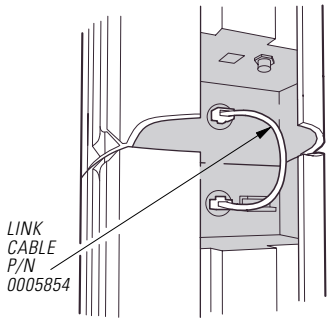


Figure 3.4a Signal Links < 1 ft / 0.3

3.4 Daisy Chaining Audio and Computer Signal Between Loudspeakers

Distances up to 2 ft / 0.6 m are for connecting multiple loudspeakers in a single cluster while distances over 2 ft / 0.6 m are for connecting physically distributed clusters.

Up to 1 ft / 0.3 m: Supplied Cat-5 Signal Link Cable
Connect between Signal Link jacks (Neutrik® EtherCon®) on vertically adjacent loudspeakers within a multi-loudspeaker cluster.

Up to 2 ft / 0.6 m: User-supplied, Cat-5 Ethernet crossover cable
Connect between Signal Link jacks (Neutrik® EtherCon®) on horizontally adjacent loudspeakers within a multi-loudspeaker cluster.

Over 2 ft / 0.6 m: 2-conductor shielded audio cable / supplied Phoenix Contact terminal block plugs
Connect Audio A, Audio B (if used), and EIA-485 in parallel daisy-chain fashion between clusters.

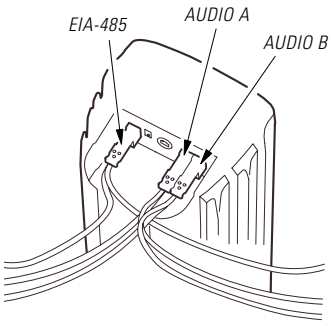


Figure 3.4b Signal Links >2 ft / 0.6 m

3.5 AC Mains Installation

3.5.1 AC MAINS SUPPLY

Provide the loudspeaker with a 50 Hz or 60 Hz AC Mains circuit capable of:

	100 V to 120 V	220 V to 240 V
DSA230	4 A	2 A
DSA250	8 A	4 A

Before applying power, ensure that the AC Mains voltage matches the voltage rating on the loudspeaker.

DANGER: DO NOT APPLY 230 V MAINS POWER IF THE VOLTAGE RATING ON THE LOUDSPEAKER IS 115 V. IMMEDIATE AND CATASTROPHIC DAMAGE TO THE LOUDSPEAKER WILL RESULT AND MAY CAUSE A FIRE HAZARD, SERIOUS PERSONAL INJURY, OR DEATH.

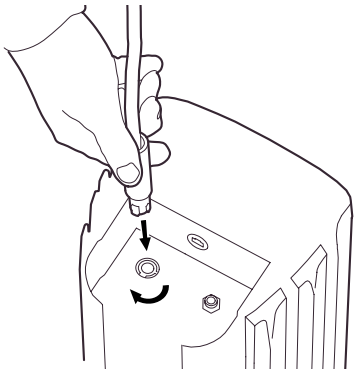


Figure 3.5 Connecting AC Mains

3.5.2 AC MAINS CABLE

Supply and connect #14 AWG / 2.5 mm power cable and appropriate AC Mains plug to the supplied Neutrik/PowerCon® connector.

3.6 Physical Installation

3.6.1 ORIENTATION

1. When installing the enclosure, there is a correct "top" and "bottom". This cannot be assumed from the physical appearance. Instead, orientation depends on application and desired acoustical performance determined using the DSAPilot.
2. Ensure the enclosure is oriented correctly by verifying which ends are supposed to be the top and bottom for the intended application. The Signal End is the end with the identification LED, visible on one end of the front of the enclosure. The Power End has the AC Mains connector.

   Note: The desired coverage cannot be gained if the enclosure is incorrectly oriented.

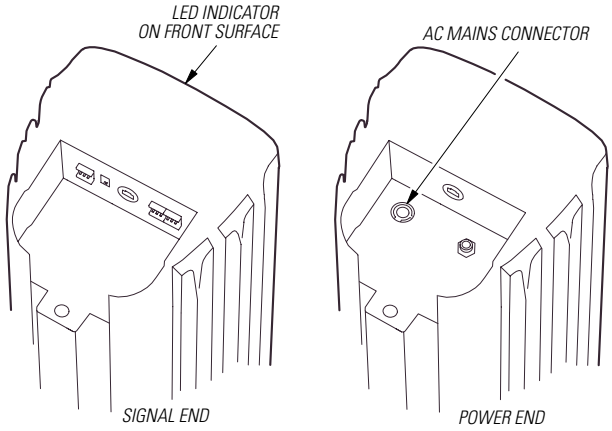


Figure 3.6 Signal End / Power End

3.6.2 MOUNTING

WARNING: Comply with all installation warnings in Section 5.5.1.

The DSA Series loudspeakers are normally intended to be flush-mounted against a vertical surface capable of supporting their weight.

1. Using the template printed on the shipping box, locate and position the supplied Wall Brackets to structure.

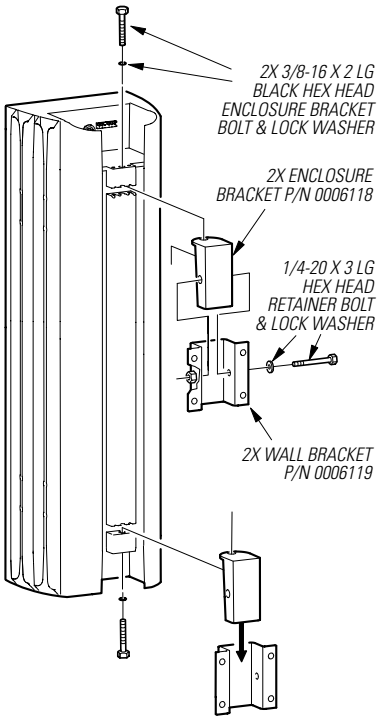


Figure 3.6.2a Bracket Installation

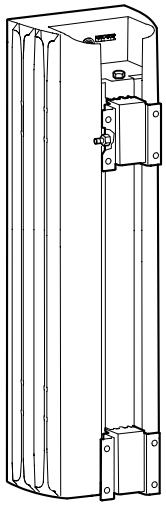


Figure 3.6.2b Installed Bracket

2. Attach the Wall Brackets to structure. You must provide attachment hardware and ensure the attachment method and structure are capable of supporting the intended load. Position the Wall Bracket weld nuts left or right to allow clearance for later insertion of the Retainer Bolt.

3. Ensuring they are oriented properly, install the two Enclosure Brackets on the loudspeaker. Insert and hand-tighten the supplied 3/8-16 Enclosure Bracket Bolt and Lock Washer for each Enclosure Bracket.

4. Lift the enclosure onto the installed Wall Brackets.

   WARNING: Use at least two people for lifting enclosure onto the brackets.

5. Insert and snugly tighten at least one of the supplied 1/4-20 Retainer Bolt and Lock Washer through the side of either of the Wall and Enclosure Brackets. This prevents the enclosure from being lifted off the Wall Brackets.

6. Securely tighten each 3/8-16 Enclosure Bracket Bolt to lock the enclosure at the desired horizontal angle.

3.7 Signal Processing

The vertical coverage is determined by programming the loudspeaker's digital signal processing.

Use the DSAPilot to determine the desired coverage. The DSAPilot calculates and optimizes the signal processing required to achieve the desired results.

High pass/low pass filters, parametric EQ, delay, and gain are user adjustable for each of the two inputs.

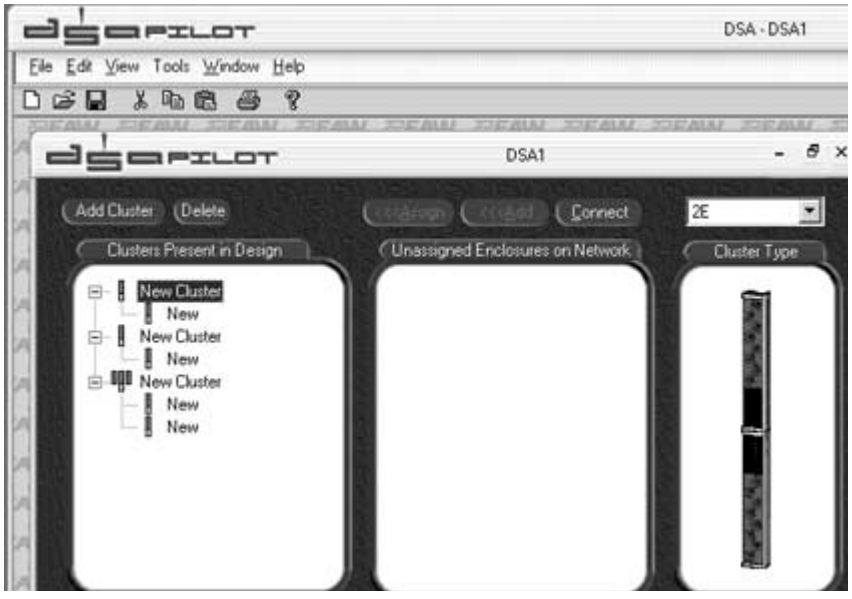


Figure 3.7 DSAPilot Main Screen

Chapter 4 Description

4.1 System Overview

DSA Series loudspeakers are variable directivity, self-powered line arrays. Each loudspeaker's vertical beamwidth is determined by the settings of an internal DSP (digital signal processor) and power amplifier for each transducer. This provides complete, on-site control over the range of possible vertical beamwidth patterns.

EAW's Windows-based DSAPilot is used to set the coverage required for each loudspeaker or loudspeaker cluster. The user-friendly DSAPilot optimizes the required signal processing for the design. This data is then uploaded to the DSA Series loudspeakers in the system. The DSAPilot normally communicates with the loudspeakers using EIA-485*. An optional CobraNet™ network interface is available.

*Formerly known as RS-485 (Recommended Standard 485)

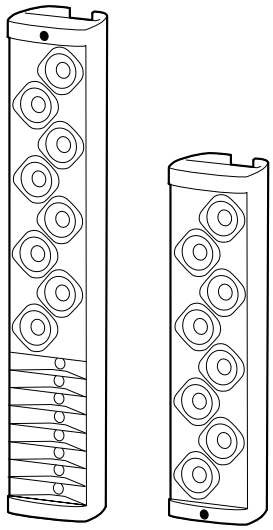


Figure 4.1.1 DSA250 & DSA230

4.1.1 DSA SERIES MODELS

DSA250: Full range, 2-way, loudspeaker system
DSA230: Low frequency and voice-only loudspeaker system

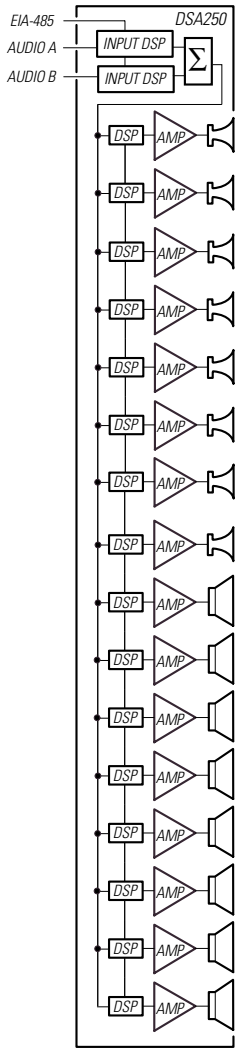
4.1.2 ACOUSTICAL BENEFITS

Each loudspeaker can be electronically adjusted on-site to direct sound primarily where needed. Unwanted sound reflections from room surfaces can be reduced, improving the direct to reverberant sound ratio. This, in turn, can significantly increase speech intelligibility. Asymmetrical pattern control can provide consistent SPL in situations with HIGH near-to-far listener distance ratios. User adjustable level control, equalization, and compression, are provided on each of the two audio inputs. For situations with multiple locations, overall signal delay for each loudspeaker cluster is also provided.

4.1.3 PHYSICAL BENEFITS

The DSA Series loudspeakers are physically narrow and quite shallow, providing a low profile to reduce their impact on architecture. Their normal mounting position is specifically designed to be flat against a vertical surface. This considerably reduces installation complexity. The DSA Series design permits several loudspeakers to be easily arrayed in one location as a cluster. This affords additional capabilities including higher output and extremely narrow vertical coverage, as well as extended pattern control, and output at lower frequencies.

DSA Series enclosures are constructed of a powder-coated, extruded aluminum body (also used as the amplifier heat sink), high-impact polystyrene end caps, a thick PVC baffle, and a finely perforated steel grille. This construction is designed for years of trouble-free use. The appearance is designed to blend attractively with a variety of architecture. The enclosure finish is a neutral white. The grille is powder-coated steel, with a perforation style that appears similar to a cloth grille at typical in-use distances. Installation hardware is included to facilitate installation in most applications.



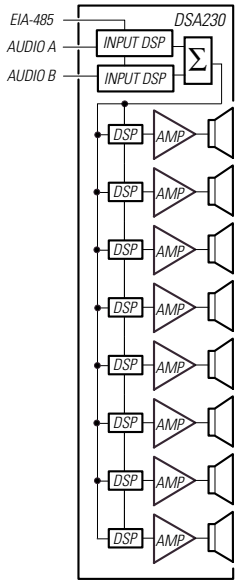


Figure 4.1.4 DSA Block Diagrams

4.1.4 ELECTRICAL BENEFITS

Built in digital signal processing, power amplification, and protective limiting significantly reduces equipment costs, space, installation, and set-up adjustments. Cabling is limited to providing AC mains, line level audio, and computer control signals. EIA-485 or optional CobraNet™/Ethernet networking technology allows all loudspeakers in a project to be adjusted and controlled from one computer. EIA-485 network topology was chosen as the supplied default because it is easy to implement. It is also unique in allowing multiple network nodes to communicate bi-directionally over a single pair of twisted wires. No other network standard combines this capability with equivalent noise rejection, data rate, cable length, and general robustness.

4.2 Features

4.2.1 ACOUSTICAL

- Vertical beamwidth is software controlled on-site to fit the application
- Wide 120 degree fixed horizontal beamwidth
- Pre-determined templates for loudspeaker clusters provide a wide range of capabilities
- DSA250 full-range loudspeaker has eight 4 in LF drivers, eight 1 in horn-loaded HF drivers
- DSA230 low frequency or voice-only loudspeaker has eight 4 in LF drivers
- Full frequency response and high output for music applications
- Extended pattern control and higher outputs at lower frequencies using additional DSA230's
- Exceptional intelligibility for reverberant rooms

4.2.2 ELECTRONIC

- Self-powered requiring wiring for AC power, line level audio, and computer control
- No amplifier or processing racks needed, reducing space and cost
- Individual amplifier and DSP for each transducer
- Convection cooled electronics eliminates noisy cooling fans
- Built-in driver protection provides high reliability
- Two audio inputs allow summed stereo or priority announcement override capability
- Electronically balanced inputs maximize the signal to noise ratio

4.2.3 COMPUTER CONTROL

- User-friendly DSAPilot software easily creates desired vertical coverage patterns
- DSP adjusted and optimized by DSAPilot for plug and play setup
- User adjustable input EQ, signal delay, level, HPF/LPF, and compression for each loudspeaker cluster
- Computer can be disconnected for no-tamper operation
- Computer can be left connected for monitoring purposes

4.2.4 NETWORKING

- EIA-485 network for remote PC operation and computer control
- Analog audio and control signals can be daisy-chained to multiple loudspeakers

· Cat-5 Link Cable links adjacent loudspeakers.
· Optional CobraNet™ interface for digital distribution of audio and computer control via Ethernet
· Provision for back up audio/computer communications using a redundant Ethernet network, when using CobraNet™.

4.2.5 PHYSICAL

· Phoenix Contact and Neutrik EtherCon and PowerCon connectors for reliable connections
· Low weight (<100 lb / 45 kg) reduces structural mounting requirements
· Mount vertically while providing asymmetrical down-angle coverage
· Brackets supplied for mounting to vertical surfaces
· Mounting allows +/-15 degree horizontal rotation of the enclosure.
· Optional hardware for suspending enclosures
· Elegant enclosure design and neutral color blends with a variety of architecture
· Rear enclosure extrusion channels can be used to route cabling

4.3 Applications

The DSA Series provides a significant advance for cost-effective implementation of line array technology in a variety of applications. As is typical for line arrays, the DSA Series is an excellent choice for voice-only applications. However, unlike typical voice-only line arrays, the DSA Series can also provide the wide frequency range, fidelity, and output levels needed for excellent music reproduction. This significantly extends its range of applications to a wide range of venue types including theaters, theme parks, retail spaces, and government facilities. Its unique capabilities, however, make it particularly well suited to applications that present a challenging acoustical, physical, or aesthetic environment.

The DSA Series is ideal for a variety of venues where achieving good vocal intelligibility is critical. These include theatres, auditoria, houses of worship, theme parks, retail spaces, government facilities, lecture halls, large conference rooms, museums, and shopping malls. It can solve acoustically difficult challenges in reverberant environments such as cathedrals, concert halls, ballrooms, rail/air/sea terminals, large lobbies, and athletic buildings. Its low profile further enhances its applicability in aesthetically sensitive environments.

Designers can use DSA loudspeakers in a variety of factory-supported DSA cluster configurations to meet specific output or directivity needs. For voice-only applications, single DSA250 loudspeakers can be placed to provide adequate output and horizontal coverage. In these cases, designers enjoy control of the vertical pattern throughout the vocal range. For broadband music reproduction, the addition of a DSA230 to each DSA250 will extend pattern control well into the LF range and provide additional LF output.

Although the DSA Series is not specifically outfitted for outdoor installations, its exterior components are inherently weather-resistant. If suitably protected from direct exposure to weather, permanent outdoor installation is possible, though is not recommended.

4.4 Engineering Design

The core acoustical design of the DSA Series dates back to the late 1930s in Harry Olson's book, "Acoustical Engineering". He showed that, by using different signal delays on the input to each transducer in a simple line array, the array's main output lobe could be effectively "steered". While this concept has certainly been used before, the design of the DSA Series goes far beyond this simple concept.

The engineering design for the DSA Series is certainly capable of "steering" the main output lobe, as per Olson. However, the shape of the lobe in the vertical plane is also variable. This allows changing the depth of the coverage to precisely fit the listening area thereby reducing troublesome near-to-far SPL differences.

A major advantage of DSA is the character of its radiation pattern. Contrary to what might be intuitively assumed, the DSA's radiation pattern is not the same as simply down-tilting a loudspeaker that has the same horizontal and vertical beamwidths. The example EASE plots illustrate this difference.

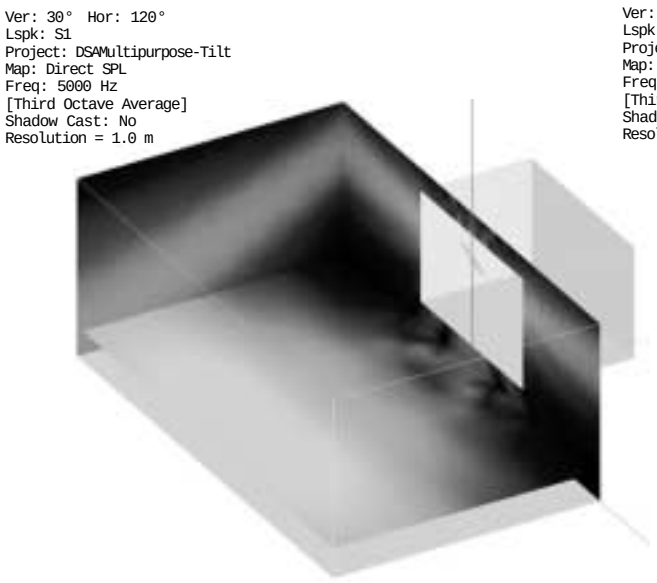


Figure 4.4a Angled Radiation Pattern

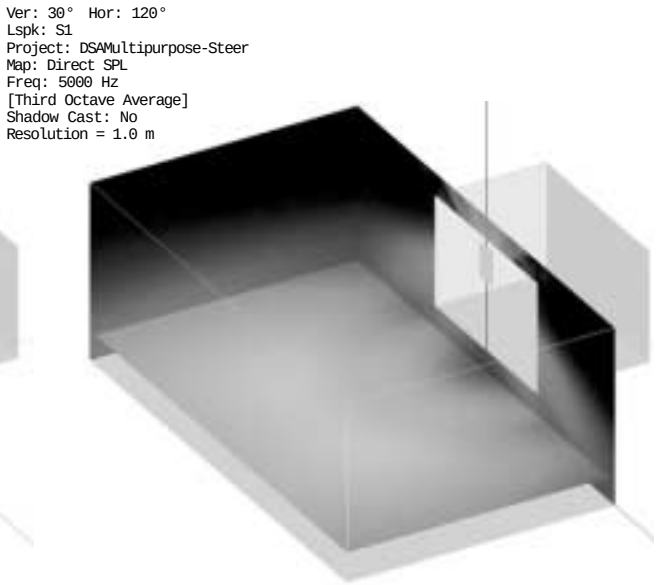


Figure 4.4b DSA Steered Radiation Pattern

The radiation pattern of the conventionally, down-tilted loudspeaker has at least two problems. The geometry of the pattern results in inadequate coverage across the front area of the room. It also focuses a distinct line of energy along the side wall. This energy is nearly at the same loudness as the floor seating area. The sound reflections off the upper part of the wall will arrive at many listeners late enough to impair intelligibility. These reflections add to the direct sound and cause the higher intensity sound seen at the rear , even though these areas are further from the loudspeaker.

By contrast, the radiation pattern of the DSA loudspeaker is far more consistent across the entire floor area. The energy it directs to the sidewalls is not only lower in level, but creates a very different reflection pattern. The sound reflected off the wall will be largely directed down into the floor or nearby listeners along the sides, arriving early enough to actually enhance intelligibility.

The required signal processing, accomplished by DSP (digital signal processing), involves parametric equalization, signal delay, frequency filtering, gain, and limiting. These parameters are individually adjusted by the DSAPilot for each transducer in each loudspeaker. The available DSP resources provide a broad range of possible coverage patterns and SPL control over distance as well as the "voicing" required for exceptional music reproduction.

The DSA allows multiple loudspeakers to be arrayed as a cluster at a single location. This allows a greater range of beamwidths, SPL, pattern control, and low frequency output than a single DSA loudspeaker can provide. The DSAPilot treats the cluster as if it were a single loudspeaker, precluding the complexities normally associated with designing clusters.

4.5 DSAPilot

The DSAPilot, used to set the loudspeaker signal processing parameters, is based on software originally developed by EAW engineers for the KF750, KF760, and, in particular, the KF900 Series products. These products require precise but variable pattern control and a high degree of fidelity for speech and music in projects that range from small houses of worship to the newest super-stadiums. Sophisticated mathematical algorithms were developed to determine the necessary adjustments to achieve these results for both multiple transducers and multiple loudspeaker clusters. This math was incorporated into highly user-friendly software. Thoroughly tested and refined in successful, real-world applications, these techniques have been applied to the DSA Series to achieve the same high degree of pattern control, musicality, and ease of setup.

Though highly complex, the DSAPilot's mathematics work behind the scenes. Because of this, the DSAPilot makes adjusting the signal processing deceptively simple. In fact, no acoustical knowledge is required to set up and adjust one or multiple DSA Series loudspeakers. The only information needed for the DSAPilot to perform its magic is the physical layout of the listening area, loudspeaker mounting location, and desired coverage area.

4.6 Low Frequency Performance

While the DSA250 is designed as a full-range loudspeaker, addition of the companion DSA230 increases directionality, and output at lower frequencies. DSA230s extend directional control to lower frequencies using classical line array theory by extending the length of the overall array. This is done by mounting the DSA230 directly below or above a DSA250 to form a longer line of low frequency transducers. In addition, the increased number of low frequency transducers couple to increase the low frequency output capability.

4.7 Comparison to Traditional Products

A major benefit of the DSA Series is achieving desired down angle coverage from a line source that is mounted flat to a vertical surface. The inclusion of power amplifiers and dedicated signal processing to each transducer provide the DSA Series with performance and capabilities well beyond those of typical multi-way loudspeakers and traditional, voice-range line arrays. The DSA Series can provide much better directional control, higher output, and wider frequency response at less cost. Significantly smaller sizes and weights, plus straightforward mounting and wiring options pay

additional benefits in reduced installation costs and operation. The flexibility of the DSAPilot to automatically optimize the acoustical performance for multiple DSA Series loudspeakers in a single larger space further enhances their advantage over traditional solutions.

4.8 Designing DSA Systems

DSA loudspeakers can be used individually, in multiples, or in various cluster configurations to satisfy a wide range of design requirements. By using different configurations, DSA performance can be varied according to the type of audio program, the frequency range for the vertical control desired, the maximum output levels, the audience location relative to the loudspeaker, and for meeting the requirements for special applications.

Chapter 5 Installation

This chapter details the requirements for installing the loudspeaker. Specific details may require some variation depending on the particular situation. However, the basic requirements are the same in all cases.

Loudspeaker refers to either a DSA230 or DSA250.

Cluster refers to any of the permissible arrangements of single or multiple DSA230s or DSA250s as defined in DSAPilot. Whether they consist of a single or multiple loudspeakers, all DSA clusters function as a single loudspeaker.

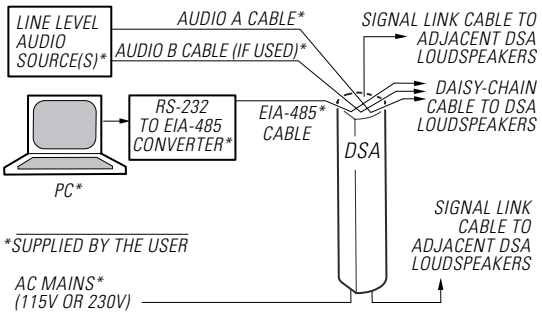

LINE LEVEL AUDIO SOURCE(S)*
AUDIO A CABLE*
AUDIO B CABLE (IF USED)*
SIGNAL LINK CABLE TO ADJACENT DSA LOUDSPEAKERS
DAISY-CHAIN CABLE TO DSA LOUDSPEAKERS
RS-232 TO EIA-485 CONVERTER*
EIA-485* CABLE
DSA
PC*
SIGNAL LINK CABLE TO ADJACENT DSA LOUDSPEAKERS
*SUPPLIED BY THE USER
AC MAINS* (115V OR 230V)

Figure 5.1 Electrical Block Diagram

5.1 Electrical Installation

This section details the electrical requirements for installing the loudspeaker. Specific cabling details may require some variation depending on the particular situation. However, the basic requirements are the same in all cases.

Basic electrical installation tasks include:

- Audio signal connection
- Computer control connection
- AC mains connection

5.1.1 CABLE ROUTING CONSIDERATIONS

The configuration and orientation of the loudspeakers will determine where signal, computer, and AC mains cabling must be connected to the loudspeakers. For certain cluster configurations it may be necessary to route cabling from one end of a loudspeaker to another.

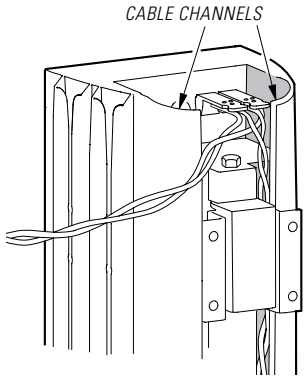


Figure 5.1.1 Cable Channels

The main cable routing method is to use the channels in the heat sink extrusion that forms the rear of the DSA250 and DSA230 enclosures. These channels are intended to be used to route and conceal cabling the length of the enclosure as required. In this way, single wall outlet locations for audio, computer, and AC mains can easily service a single loudspeaker or loudspeaker cluster.

To facilitate cable routing, clusters have been arranged, where possible, so the Power Ends of the enclosures are adjacent. This minimizes the routing of AC mains cables, which are heavier and more difficult to thread into the extrusion than signal cables.

5.1.2 AUDIO SIGNAL CONNECTION

CobraNet™: Skip to Section 5.2 if using CobraNet™ for distribution of the audio and control signals.

Audio A or Audio B: 2-conductor twisted pair, shielded, audio cable connected to supplied 3-pin Phoenix Contact Terminal Plug and to the line level audio signal source.
Nominal level: 0 dBu / 0.775 V rms.
Recommended Conductor Gauge:
24 AWG to 18 AWG / 0.2 mm to 1 mm

Audio A and Audio B: As above but 4-conductor twisted pairs

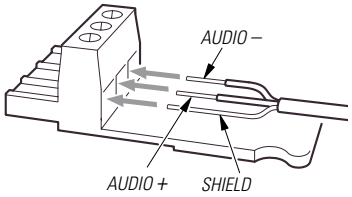


Figure 5.1.2 Audio A & Audio B

5.1.3 COMPUTER CONTROL CONNECTION

CobraNet™: Skip to Section 5.2 if using CobraNet™ for distribution of the audio and control signals.

EIA-485 (formerly RS-485): 2-conductor twisted pair, shielded, cable connected to supplied 3-pin Phoenix Contact Terminal Plug and to EIA-485 port for the computer.
Recommended Conductor Gauge:
24 AWG to 18 AWG / 0.2 mm to 1 mm

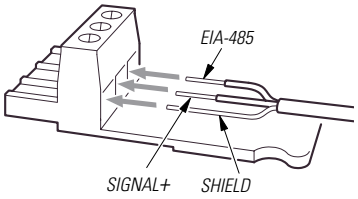


Figure 5.1.3 EIA-485 Connector

NOTES:

1. Do not combine EIA-485 and audio signals in the same cable.
2. An EIA-485 converter is required to convert a PC's RS-232 or USB port to a 2-wire EIA-485 port. While there are many converter products available, contact EAW's Application Support Group (See Section 7.3) for recommendations about suitable models.
3. EIA-485 cabling has special requirements and limitations. See Appendix 8.3 for details.

5.1.4 DAISY CHAINING COMPUTER AND AUDIO SIGNALS WITHIN CLUSTERS WITH MULTIPLE LOUDSPEAKERS

NOTE: The Signal Link jacks carry both computer and audio signals. The cable between the Signal Link jacks must be wired as a standard Ethernet crossover cable. A cable wired as a standard Ethernet straight through cable will not work.

Crossover Cable Wiring

STANDARD END PINS	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
CROSSOVER END PINS	*3*	*6*	*1*	*4*	*5*	*2*	*7*	*8*

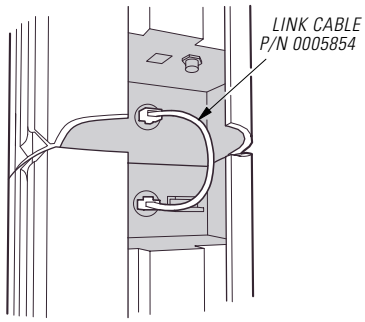


Figure 5.1.4 Linking < 1 ft / 0.3 m

1. Up to 1 ft / 0.3 m between adjacent over/under loudspeakers in a cluster:
   Supplied Cat-5 Signal Link Cable
   Connect between unused Signal Link jacks (Neutrik EtherCon) on vertically adjacent ends of the loudspeakers.
2. Up to 2 ft / 0.6 m between adjacent side-by-side loudspeakers in a cluster:
   User-supplied Cat-5 crossover cable.
   Connect between unused Signal Link jacks (Neutrik EtherCon) on horizontally adjacent ends of the loudspeakers.

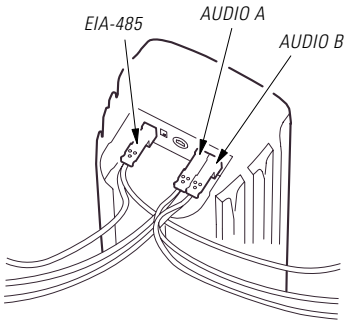


Figure 5.1.5 Linking > 2 ft / 0.6 m

5.1.5 DAISY CHAINING COMPUTER AND AUDIO SIGNALS BETWEEN CLUSTERS

Any distance (within EIA-485 limitations) between clusters:
2-conductor shielded cable

Audio A, Audio B, and EIA-485

Connect in parallel to the incoming signal cables on one loudspeaker in the first cluster and connect to the same signal ports on one loudspeaker in the next cluster. Use the supplied 3-pin Phoenix Contact terminal plugs.

Recommended Conductor Gauge:
24 AWG to 18 AWG / 0.2 mm to 1 mm

5.1.6 EIA-485 TERMINATE SWITCH

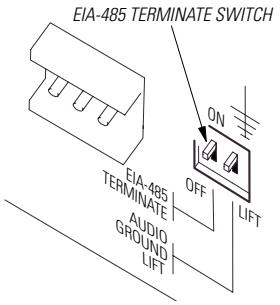


Figure 5.1.6a EIA-485 Terminate Switch

EIA-485 termination has special requirements and limitations. See Appendix 8.3 for details.

Single Cluster:

Set the EIA-485 Terminate Switch on the loudspeaker (connected via the Phoenix connector) to "ON".

Multiple Clusters:

Set the EIA-485 Terminate Switch to "ON" ONLY on the loudspeaker (connected via the Phoenix connector) at the end of the EIA-485 cable run furthest from the computer. Set all other Terminate Switches to "OFF".

CAUTION: Engaging the EIA-485 Terminate Switch on more than one loudspeaker on the EIA-485 cable run can cause intermittent or non-existent communications.

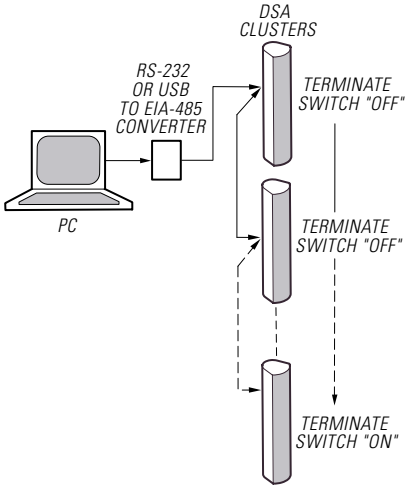


Figure 5.1.6b EIA-485 Network Diagram

5.2 CobraNet™ Network Connections

This section provides details about using the optional CobraNet™ technology for distribution of audio and computer control signals.

5.2.1 DESCRIPTION

CobraNet™ is a combination software, hardware, and network protocol that replaces the audio and computer connections described in Section 5.1. Digitized audio and computer control is distributed by a CAT-5 (or better) cable to each loudspeaker. The network infrastructure must be designed using standard IEEE 802.3u 100BASE-T Fast Ethernet hardware. The network will not function properly using 10BASE-T technology.

5.2.2 COBRANET™ IS USUALLY DESIRABLE TO USE WHEN:

- A star cable configuration is easier to implement for multiple loudspeakers
- A high degree of noise immunity is needed for the audio
- Future system expansion is likely
- Long cable runs that permit fiber optic cabling
- Other CobraNet™-capable products are used in the same installation
- The number of loudspeakers and clusters exceeds 32
- The audio source(s) have digital outputs

5.2.3 ADDITIONAL EQUIPMENT YOU MUST SUPPLY FOR COBRANET™:

- Loudspeaker interface:
  EAW CM-1 CobraNet™ Interface Card (P/N 0005987)
  for each DSA Series loudspeaker
- Audio/Computer interface:
  Converts signals to CobraNet™ protocol
- Ethernet switch or hub:
  For networking multiple loudspeakers over Ethernet

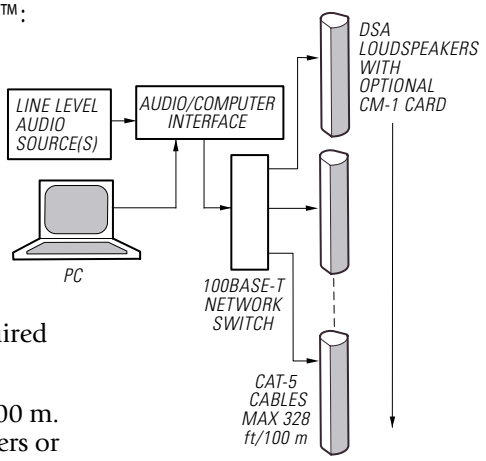


Figure 5.2.3 Basic CobraNet™ Diagram

5.2.4 CABLING:

A CAT-5 or better cable with RJ-45-compatible connectors is required for each loudspeaker.

NOTE: Ethernet cable length is limited by specification to 328 ft / 100 m. Longer runs are possible using network hubs or switches as repeaters or by conversion to fiber optic cable.

5.2.5 AUDIO/COMPUTER INTERFACE:

Audio and RS-232 (for the DSAPilot control signals) must be converted to the CobraNet™ protocol and connected to the network via an RJ-45 Ethernet port. Products that do this are available from several manufacturers. Your choice will depend, in part, on how many and what form of audio signals (digital or analog) you need to distribute.
Manufacturers of converters include:
Peavey, QSC, Rane, Symetrix, Whirlwind, and Yamaha.

5.2.6 LOUDSPEAKER INTERFACE:

An optional EAW CM-1 CobraNet™ Interface Card must be installed in the slot provided in loudspeaker. To do this, see installation instructions that accompany the CM-1.

Connect the PRIMARY RJ-45 Ethernet connector to the Ethernet cable.

The SECONDARY RJ-45 Ethernet connector on the CM-1 is for connecting to a second, redundant Ethernet network. This would be designed as a back-up network that automatically takes over in the event of failure in the primary network.

The digital audio received by the CM-1 connects directly to the loudspeaker's digital signal processing. It is converted back to analog at the inputs to the internal power amplifiers.

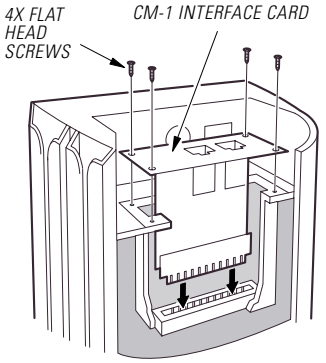


Figure 5.2.6 CM-1 Interface Card
(See Installation Instructions with Card)

5.2.7 MULTIPLE LOUDSPEAKERS:

To connect multiple loudspeakers to the network, the Ethernet output on the audio/computer interface must connect to a network switch or hub. A network switch is normally recommended. The switch must have an Ethernet port for each loudspeaker.

A CAT-5 cable is required from the Ethernet port on the CM-1 Interface Card in each loudspeaker to its port on the network switch. For networks requiring cable runs longer than 328 ft / 100 m, a repeater network or fiber optic cabling is recommended. Do NOT mix hubs and switches on a repeater network. Network switches and hubs are available through most computer retailers.

5.2.8 SUPPORT FOR COBRANET™ / ETHERNET

See Sections 8.4 and 8.5 for support information for Ethernet and CobraNet™.

5.3 AC Mains Power Connection

This section details the requirements for the AC mains which is the AC power connection required by each DSA loudspeaker.

5.3.1 AC MAINS SUPPLY

CAUTION: Read all cautionary notes concerning electrical power in Chapter 1.

Each DSA Series loudspeaker is rated for a particular nominal AC Mains voltage: 115 V or 230 V. Provide the loudspeaker with 50 Hz or 60 Hz AC Mains circuit capable of:

	100 V to 120 V	220 V to 240 V
DSA230	4 A	2 A
DSA250	8 A	4 A

Before applying power, ensure that the AC Mains voltage matches the voltage rating on the loudspeaker.

DANGER: DO NOT APPLY 230 V MAINS POWER IF THE VOLTAGE RATING ON THE LOUDSPEAKER IS 115 V. IMMEDIATE AND CATASTROPHIC DAMAGE TO THE LOUDSPEAKER WILL RESULT AND MAY CAUSE A FIRE HAZARD, SERIOUS PERSONAL INJURY, OR DEATH.

5.3.2 AC MAINS CABLE

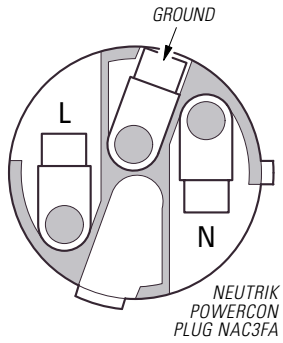


Figure 5.3.2 PowerCon Plug

The supplied Neutrik PowerCon NAC3FCA plug mates with the Neutrik PowerCon NAC3MPA AC MAINS jack on the loudspeaker. Because of both varying installation and electrical code requirements, neither an AC Mains cable nor AC mains supply connection are supplied.

1. Supply and connect a 3-conductor power cable to the supplied PowerCon plug, ensuring a proper ground connection.

2. Supply and attach an appropriate connector for the AC Mains connection at the other end.

Recommended Power Cable	
Conductor Gauge:	14 AWG / 2.5 mm (limited by PowerCon design)
Cable O.D.:	5 mm to 15 mm (limited by PowerCon design)
Recommended length:	Maximum 25 ft / 8 m (for <2% voltage drop at peak input power)

NOTE: If the power cable is longer than 25 ft / 8 m the voltage drop will increase.

5.3.3 POWER ON / OFF

There is NO power on/off switch on DSA Series loudspeakers. The loudspeaker will be powered on (energized) when connected to an AC mains supply. The LED on the "Signal End" will flash rapidly for about 3 seconds when first powered on. This is normal and indicates the electronics are being initialized.

The LED should then go off. See Section 6.1.2 for other LED indications.

If it is desired to completely power off (de-energize) the loudspeaker, a conveniently located AC mains disconnect must be supplied or the power cable must be unplugged from the loudspeaker or the AC mains supply.

The PowerCon connector is a locking connecter. To lock, twist 1/4 turn clockwise after fully inserting into the jack. It is recommended the connection be made at the loudspeaker before connection to the AC mains supply.

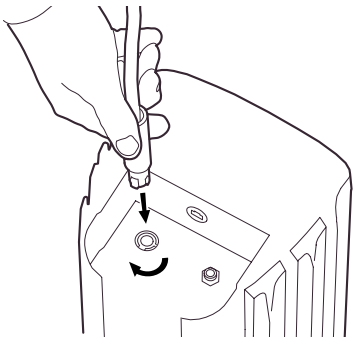


Figure 5.3.3 Connecting AC Mains

5.3.4 AC MAIN FUSE:

If excessive AC mains input current is detected, the replaceable fuse will blow. This can occur for a variety of reasons, such as internal failure, excessive AC mains voltage, or excessive amplifier output levels.

If the fuse blows, replace it only with a fuse of the correct type and rating as listed below. In the unlikely event the fuse blows again, internal failure is indicated. This will require troubleshooting and repair by a qualified service technician. Do not attempt further use of the loudspeaker until such repairs are made. See Section 8.2 "Troubleshooting".

Fuse Type:	AGC (0.25 in x 1.25 in) slow-blow	
Rating:	115 V AC	230 V AC
DSA230	4 A	2 A
DSA250	8 A	4 A

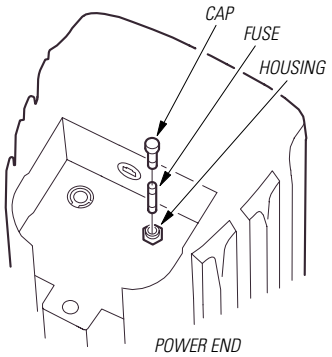


Figure 5.3.4 Fuse

5.4 Grounding

5.4.1 ELECTRICAL GROUND

Ensure that the AC mains grounding conductor in the power cable is properly grounded in accordance with applicable electrical codes.

5.4.2 AUDIO GROUND

The Audio Ground Lift switch may help isolate audio ground loops. This dip switch disconnects the shield pins on all the audio connectors from the internal audio ground. This affects the audio shield pins on the Audio A and Audio B connectors. Use this switch as needed for reducing ground loop noise.

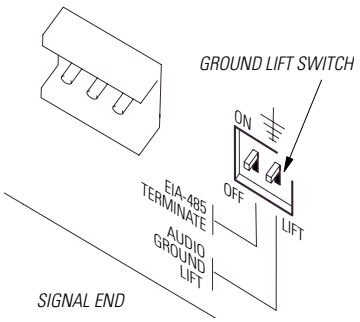


Figure 5.4.2a Ground Lift Switch

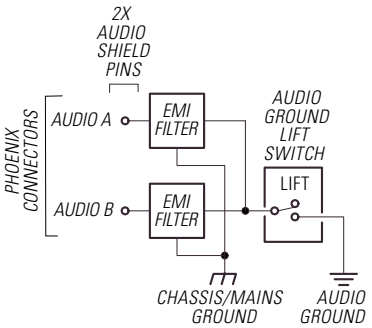


Figure 5.4.2b Ground Lift Function

5.5 Physical Installation

This section details the physical requirements and methods for installing the loudspeaker. Specific mounting procedures detailed herein may require some variation depending on the particular situation. However, the basic methodology is the same in all cases.

Basic installation tasks include:

Installing the Enclosure and Wall Brackets
Mounting the loudspeaker

5.5.1 INSTALLATION WARNINGS

DANGER: DSA Series loudspeakers must be securely mounted to structure capable of supporting their weight. The user is responsible for providing properly engineered attachment of the supplied Wall Brackets to structure, using hardware rated for the load. Failure to follow this warning may result in failure of the mounting causing the loudspeaker to fall down, with possible equipment damage, injury, or death.

DANGER: Only persons with the knowledge of proper hardware and installation techniques required should attempt to install DSA Series loudspeaker systems overhead. Failure to follow this precaution may result in damage to the equipment, injury, or death.

CAUTION: The actual coverage provided by a DSA Series loudspeaker will be largely determined by the DSAPilot adjusting its signal processing settings. However, the loudspeaker must still be positioned in a location that is within the possible adjustment range for the desired coverage.

CAUTION: It is physically possible to mount a DSA Series loudspeaker either end up. Because of the transducer-specific signal processing, it will NOT provide the desired performance if installed upside down in its intended application.

CAUTION: For DSA Clusters with two or more loudspeakers mounted one over the other, it is recommended to make all cable connections before lifting each loudspeaker onto the wall brackets. See Sections 5.2 through 5.6. Once the loudspeakers are mounted, access to the connectors may be difficult.

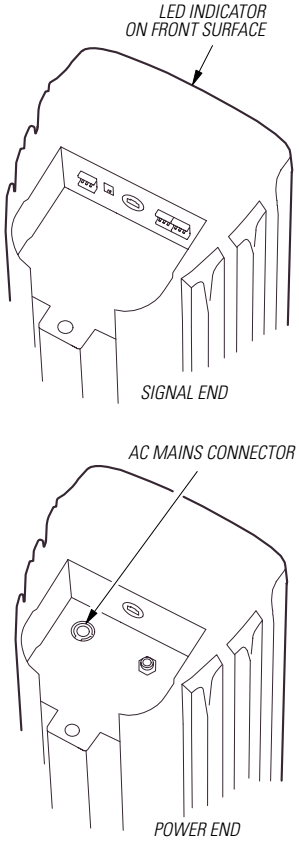


Figure 5.5.2 Signal End / Power End

5.5.2 PHYSICAL ORIENTATION – SIGNAL END / POWER END

The directionality of the DSA Series loudspeakers partly depends on using specific signal delays to each transducer to control its sound arrival to the listeners. As such, the DSAPilot makes assumptions about the physical location of each transducer in the enclosure. This means there is a correct "top" and "bottom" to each enclosure that is specific to each application.

The two ends of DSA loudspeakers are referred to as the Signal End and Power End. In addition to this physical difference, there is a built-in LED indicator on the front of the Signal End of each loudspeaker. The orientations are shown in the DSAPilot graphics. When activated by the DSAPilot software, this LED can be used to verify both the correct up-down orientation and, when multiple loudspeakers are used, the correct location of each. For the DSA250, the Power End is the end with the HF subsystem and Signal End is the end with the LF subsystem.

5.5.3 MULTIPLE LOUDSPEAKERS AND CLUSTER CONFIGURATIONS

CAUTION: Only clusters defined by the DSAPilot or pictured herein may be used. Any other configurations will result in poor to unusable performance. In the future other configurations may be added to the DSAPilot.

In some applications, tighter MF/HF pattern control, higher output, or narrower vertical coverage may be desirable. Where higher LF output capability is desired, height restrictions may not permit the ideal over-under mounting of the DSA250 and DSA230 models. Because of these and other possible requirements, the DSAPilot allows several cluster configurations to be used in a single or in multiple locations to achieve various coverage and output results. See the DSA Application Guide for details.

NOTE: Where aesthetics or other considerations warrant, side-by-side configurations can be mirrored without affecting the results.

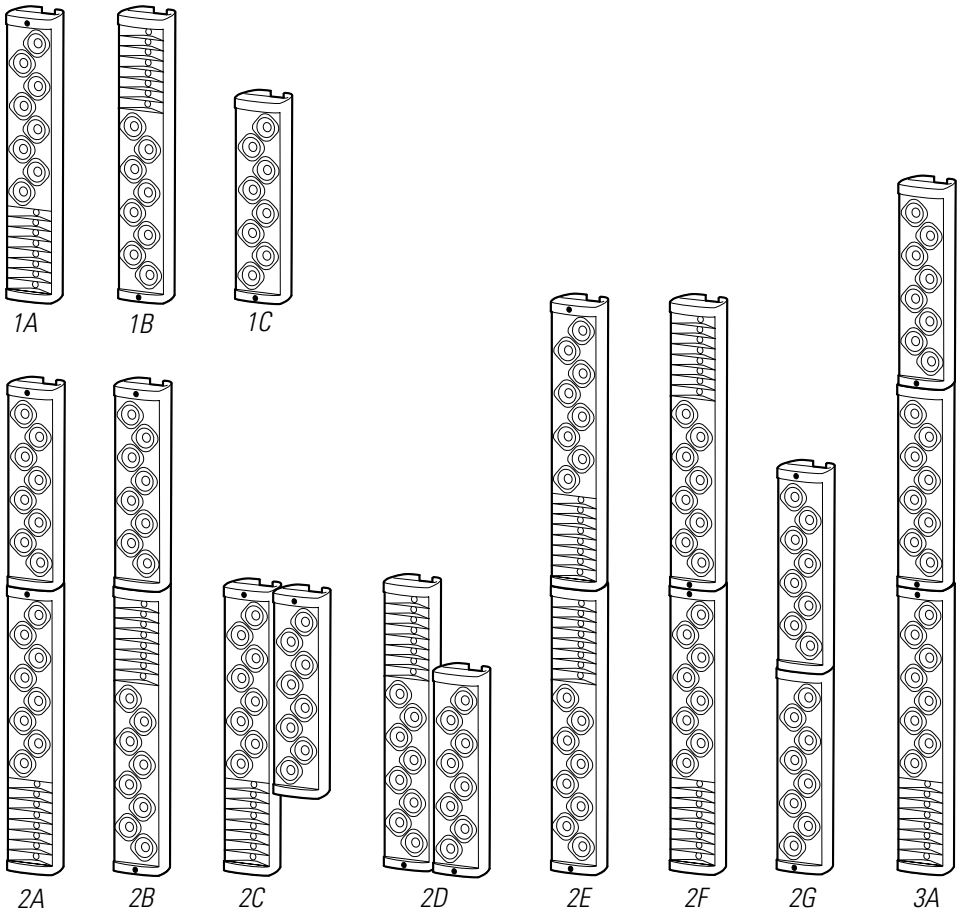


Figure 5.5.3 DSA Cluster Configurations

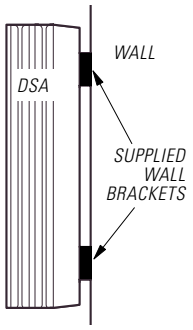


Figure 5.5.4a Wall Mounted

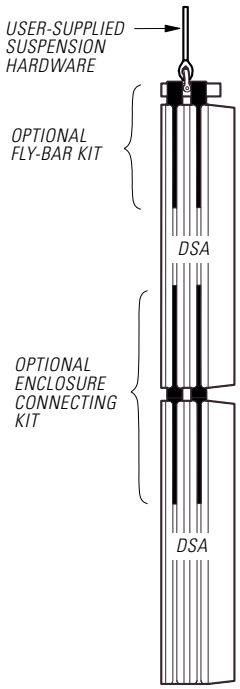


Figure 5.5.4b Suspended

5.5.4 INSTALLATION OPTIONS

Normal Method: This method is for installing DSA loudspeakers flush-mounted to a vertical wall surface using the supplied brackets. The installation instructions herein apply to this installation method.

Optional Normal Method: This method is for suspending DSA loudspeakers. The optional DSA Fly-Bar Kit is required for suspension. For suspending more than one loudspeaker from a single Fly-Bar, the optional Enclosure Connecting Kit is also required. These accessories are supplied with complete instructions for their use.

Alternate Methods: In some applications, the DSA loudspeakers may require suspension or other methods of installation. Please contact EAW for assistance when the normal method cannot be used. (See Section 7.3)

Orient each enclosure in the cluster as shown in the DSAPilot diagrams according to the location of the Signal End with the LED.

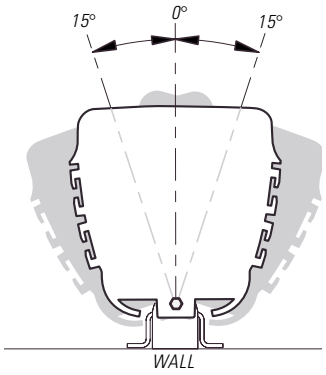


Figure 5.5.5a Horizontal Rotation Single Enclosure

5.5.5 ANGLING ENCLOSURES

1. Vertical Angle: Normally, the DSA Series enclosures are designed to be mounted flat to a vertical surface.
2. Horizontal Angle Single Loudspeakers: When mounted flat to a vertical surface, the mounting hardware allows the enclosures to be rotated up to +/-15° degrees horizontally, 0° being perpendicular to the wall surface. This allows directing its fixed 120° horizontal coverage anywhere within a 150° arc around the front of the loudspeaker.
3. Horizontal Angle Over/Under Loudspeakers: Always align over/under enclosures so they are aimed in the same direction.
4. Horizontal Angle Side-by-Side Loudspeakers: These clusters cannot be rotated horizontally. Always position the DSA250 and DSA230 loudspeakers for these clusters so that their aiming axes are perpendicular to the mounting surface.

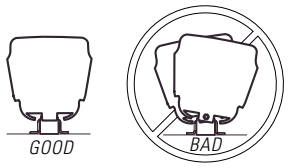


Figure 5.5.5b Horizontal Rotation Over / Under Enclosures

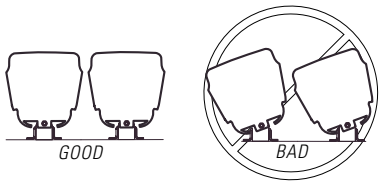


Figure 5.5.5c Horizontal Rotation Side-by-Side Enclosures

5.5.6 MOUNTING HEIGHT

The acoustical reference point for the DSAPilot is the geometric center of the cluster, which is halfway between the top of the top enclosure to the bottom of the bottom enclosure. That means for a steering angle of 0 degrees "on-axis" is the physical center of the cluster. The elevation entered into DSAPilot refers to this point. This means that if an elevation is entered that is less than half the height of the cluster, it will go "through the floor" in the software.

For installation purposes, the mounting height of the bottom enclosure in a cluster will be the cluster elevation as entered in DSAPilot minus one-half the total physical height of the cluster

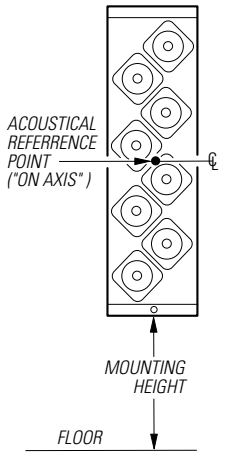


Figure 5.5.6 Mounting Height

5.5.7 WALL BRACKET INSTALLATION

DANGER: Only persons with the knowledge of proper hardware and installation techniques required should attempt to install DSA Series loudspeaker systems overhead. Failure to follow this precaution may result in damage to the equipment, injury, or death.

The supplied Wall Brackets are designed for attachment of the loudspeaker enclosure to a wall or other vertical surface. Ensure both the attachment hardware and the architectural structure are capable of supporting the load with a design factor that meets applicable building codes.

Weights:

DSA230 63 lb / 28.6 kg
DSA250 90 lb / 40.0 kg

1. Using the supplied Wall Bracket Mounting Template or exact measurements, locate the four mounting points required to attach each supplied Wall Bracket to the supporting structure. Mounting templates are provided on the shipping-carton and CD-ROM. A bracket template is shown in chapter 9. Ensure that these mounting points are plumb and square to each other so the enclosure will be exactly vertical when installed. Being out of plumb and/or square can prevent them from properly engaging the Enclosure Brackets attached to the enclosure.

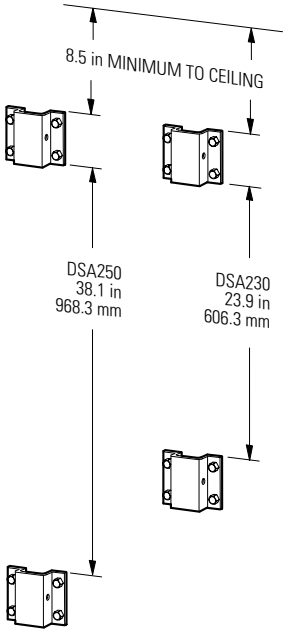


Figure 5.5.7a Wall Bracket Spacing

Critical Dimensions:

1. Spacing between the Wall Brackets for a single loudspeaker must be within 0.1 in / 3 mm of the dimensions in Figure 5.5.7a.

   In order to lift a loudspeaker onto its wall brackets, spacing between the top wall bracket and ceiling, or other overhead obstruction, must be 8.5 inches minimum. NOTE: 8.5 inches allows only 0.25 inches extra clearance.

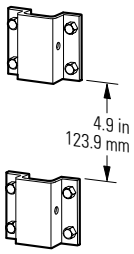


Figure 5.5.7b Over-Under Spacing

2. Spacing between the Wall Brackets for loudspeakers mounted over-under fashion must be 4.9 inches.

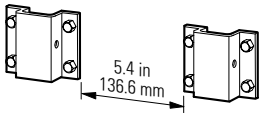


Figure 5.5.7c Side-By-Side Spacing

3. Spacing between the Wall Brackets for loudspeakers mounted side by side must be 5.4 inches.

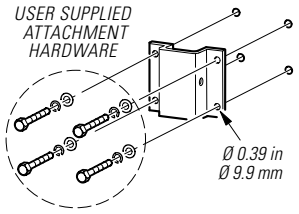


Figure 5.5.7d Wall Bracket Attachment (For illustration purpose only. Attachment hardware selection is installer's responsibility.)

4. Provide attachment hardware and secure the supplied Wall Brackets to the mounting structure, complying with all Caution and Warning notes in Section 5.5.1.

NOTE: The Wall Brackets have a weld nut on one side. Be sure to locate this weld nut to the right or left such that the Retainer Bolt can be inserted into the opposite side of the Wall Bracket after the loudspeaker is mounted.

5.5.8 ENCLOSURE BRACKET INSTALLATION

Insert each supplied Enclosure Bracket into its slot near each end of the enclosure, verifying the proper orientation of the enclosure. Insert a supplied 3/8-16 x 2 in Enclosure Bracket Bolt with its lock washer into each bracket bolt hole in the enclosure. Thread each bolt into the weld nut on its Enclosure Bracket and hand-tighten.

CAUTION: Make sure the brackets are installed so the enclosure orientation will be correct when the enclosure is mounted.

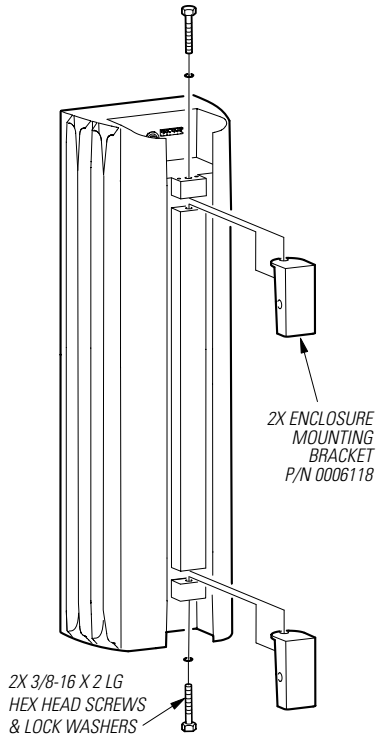


Figure 5.5.8 Enclosure Bracket Installation

5.5.9 ENCLOSURE INSTALLATION

Lift the enclosure onto the structure-mounted Wall Brackets

DANGER: It is recommended that lifting the enclosure in place be performed by at least two people to prevent it from falling during its installation and causing possible equipment damage, injury, or death.

CAUTION: For DSA Clusters with two or more loudspeakers mounted one over the other, it is recommended to make all cable connections before lifting the loudspeakers onto the wall brackets. See Sections 5.2 through 5.6. Once the loudspeakers are mounted, access to the connectors may be difficult.

IMPORTANT: When installing loudspeakers mounted vertically end to end, install the lower loudspeaker first.

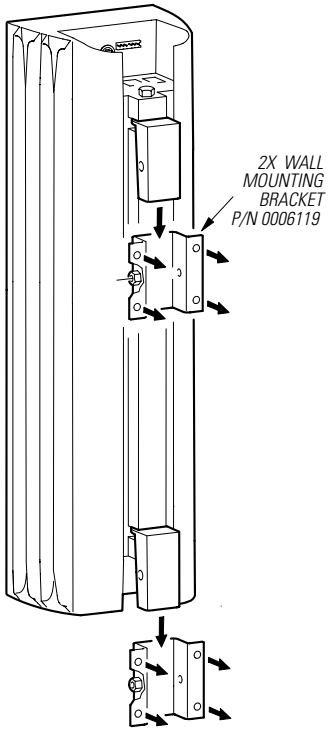


Figure 5.5.9a Enclosure Installation

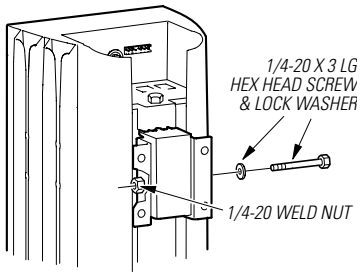


Figure 5.5.9b Retainer Bolt Installation

1. Install at least one of the supplied 1/4-20 X 3 in Retainer Bolt with its lock washer through the side of either the top or bottom Wall/Enclosure Bracket and snugly tighten. The bolt threads into a weld nut on the side of the Wall Bracket. This Retainer Bolt prevents the enclosure from being lifted off the Wall Brackets without first removing the bolt. Note that the Retainer Bolt does not "clamp" or support anything. It serves only to retain the enclosure on the wall brackets, not to lock it into position.

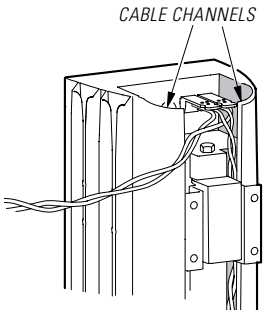


Figure 5.5.9c Cable Routing

2. Route cabling as required using the rear channels in the enclosures extrusion.

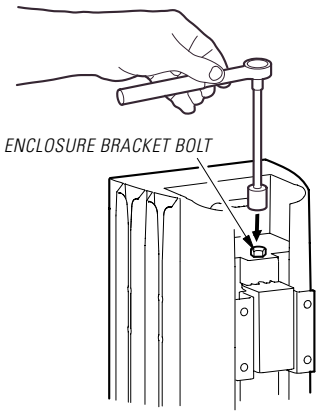


Figure 5.5.9d Secure the Enclosure Position

3. Rotate the enclosure to the desired horizontal angle. Firmly tighten each Enclosure Bracket Bolt to secure the enclosure in the desired position.

5.6 Initial Set-Up

5.6.1 VERIFY LOUDSPEAKER ORIENTATION AND POSITION

Using the DSAPilot, and with communications established with the loudspeakers, click on each loudspeaker in DSAPilot. The LED in both the DSAPilot graphic and on the actual loudspeaker will illuminate. Ensure that the physical orientation and position of each loudspeaker corresponds to that shown in the DSAPilot graphic. See the DSAPilot help file for further information.

CAUTION: Incorrect orientation or cluster position will result in poor to unusable performance.

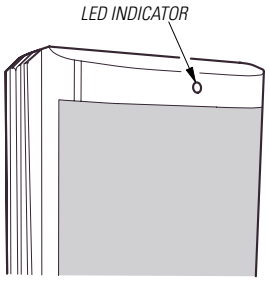


Figure 5.6 Identification LED

5.7 Acoustical Installation

Adjustment of the signal processing and thus the acoustical performance for each DSA Cluster is accomplished using the DSAPilot program. Complete instructions for its use can be found in the DSAPilot Help file.

These are the basic tasks that need to be done using the DSAPilot:

1. Select each cluster configuration used in the system design
2. Assign the installed clusters to those selected in the DSAPilot
3. Set the Steering parameters for each cluster
4. Configure the audio input routing for each cluster
5. Set the user-adjustable gain, EQ, compression, or signal delay for the inputs
6. Set the desired Power Saving operation
7. Save the final signal processing settings for the system to a file

Chapter 6 Operation

The general operation of a DSA loudspeaker is similar to the operation of most loudspeakers. Initial system set-up and overall tuning adjustments detailed in this Chapter must be made using DSAPilot. For details about using DSAPilot functions refer to the DSAPilot Help File. Performance operation is largely concerned with adjusting the operating levels, avoiding excessive input signals and, if needed, making in-performance "voicing" adjustments using external equalization

These operation instructions assume that the loudspeaker has AC Mains, audio signal, and computer control lines properly connected, and that they are passing signals correctly.

6.1 Operational Functions

There are several, unique functions that affect and enhance operation. These include Power Management, LED Indicator, and signal Monitoring.

6.1.1 POWER MANAGEMENT

The Power Management feature is a power saving function that improves energy efficiency. This feature automatically puts the DSA amplifiers into stand-by mode similar to a computer monitor. The initiation of this mode occurs after the input signal is absent for a period of time.

Enable or disable this function using DSAPilot. If enabled, the period of time the input signal must be absent before entering stand-by is adjustable. In addition, DSAPilot allows forcing the standby condition should the need arise to de-activate the amplifiers without disconnecting the AC mains.

6.1.2 LED INDICATOR

The LED Indicator located on the front of a DSA loudspeaker at the "Signal End" can be set to indicate the status of several operating conditions. Enable or disable each indication using DSAPilot. The actual conditions monitored by the LED are not affected by enabling or disabling the LED indication.

1. Initialization: The LED on the "Signal End" will flash rapidly for about 3 seconds when first powered on. This is normal and indicates the electronics are being initialized. The LED should then go off. This indication is permanently enabled.

2. Input Clip: If this indication is enabled, random flashing shows that the audio input signal is clipping the A to D converters at the input. To correct this condition, reduce the input signal level at the source. Because the input gain is after the A to D converters, the DSA input gain adjustment will have no effect on this condition. NOTE: This is likely an unusual condition because the LED will respond only if the input signal levels are greater than +24 dBu. It is recommended that this function normally be disabled.

3. Output Compressor/Limiter Active: If this indication is enabled, random flashing shows that the amplifier output compressor/limiters have been activated. Occasional flashing is acceptable. Flashing more than once every few seconds means the input signal level is too high. To correct this condition during a performance, reduce the input signal level at the signal source. If the source levels must normally be run at such levels, then reduce the DSA input gain using DSAPilot. Because of possible audio artifacts, this latter adjustment should not be done during a performance.

   NOTE: It may be desirable to disable this indication to avoid the audience seeing flashing LEDs, particularly on dynamic program. In this case, determine the source level that triggers the Output Compressor/Limiters. Monitor and control the source level so as not to exceed this pre-determined trigger level. This will help prevent the DSA Output Compressor/Limiters from activating more than occasionally.

4. System Error: If this indication is enabled, flashing at regular intervals indicates a fault in the DSA's electronics. Faults include malfunctioning amplifiers or DSPs, over temperature, and low battery. If a fault is indicated, use DSAPilot to determine the exact problem.

   NOTE: A battery is used to retain the DSA's settings when disconnected from the AC Mains. A low battery requires replacement by the EAW Service Department or the service department of the EAW Distributor for your country. Expected battery life is 10 years without being connected to the AC mains.

5. Identification: Using DSAPilot during initial system set-up, this function is used to physically identify with which cluster DSAPilot is communicating. Selecting a cluster or an individual loudspeaker within a cluster in DSAPilot will turn on the LEDs in the corresponding enclosures.

6.1.3 SIGNAL MONITORING

Real-time Input and output signal levels can be monitored using DSAPilot.

6.2 Operational Check List

To operate a DSA loudspeaker, pre-performances checks and adjustments should be made. In typical permanently installed applications, these checks would normally be one-time, set-up adjustments that may only need to be periodically verified. All of these steps require using DSAPilot.

1. Set the Power Management function as appropriate for your application.

2. Select each cluster in the DSAPilot design and verify the LED indicator illuminates on the corresponding physical cluster.

3. Verify that the LED indicator on each enclosure is at the top or bottom as shown in DSAPilot.

4. Adjust the input gain for each cluster for the desired nominal output level for the expected input signal levels.

5. Adjust the input EQ for each cluster for the desired voicing to accommodate room acoustics, program content, or personal taste.

6. Adjust the input Limiting for each cluster to prevent higher than desired output SPLs.

6.3 Normal Operation

6.3.1 POWERING UP

Power is applied to DSA in one of three ways:

1. Always On: Connect the loudspeaker to a continuously powered AC mains supply. The loudspeaker is always ready for use. For this mode, disable the Power Management function.

2. Off/On: Connect the loudspeaker to an AC mains supply which is switched on and off between uses. The AC mains must be switched on for each use. For this mode, disable the Power Management function.

3. Standby/On: Connect the loudspeaker to a continuously powered AC mains supply. The loudspeaker will be ready when input signal is applied. For this mode, enable the Power Management function.

6.3.2 SIGNAL PROCESSING SETTINGS

When powered up, the signal processing in each loudspeaker will be set to what it was for the previous use. The signal processing settings are retained by non-volatile memory in each loudspeaker. This memory will last indefinitely when connected to the AC mains. When disconnected from AC mains, a battery supplies power to this memory. The expected battery life without being connected to the AC mains is 10 years.

6.3.3 OPERATION

Operate DSA similarly to any other loudspeaker. This normally involves setting the source levels to achieve the desired output as well as applying external equalization or other signal processing to achieve certain desired results. DSA's internal signal processing, set using DSAPilot, should not be used for in performance adjustments.

6.4 Operational 'DOS' and 'DONTS'

6.4.1 EQUALIZATION

If equalization is required for tailoring the frequency response during performances, use an external equalizer such as a good quality 1/3 octave graphic equalizer, for this purpose. Connect the equalizer in-line with the DSA input signal. The DSA input equalization, adjusted via DSAPilot, should be used only for overall tuning adjustments made during initial system set-up.

6.4.2 MAXIMUM OUTPUT

At the highest usable operating levels, the LED Indicator on the loudspeaker and in the level meters in DSAPilot should show no more than occasional clipping. Occasional clipping means the LED indicator, if enabled, and DSAPilot meter will indicate clipping at most once every few seconds.

6.4.3 FREQUENCY CONTENT

Do not attempt to boost low frequencies below about 100 Hz. The 4 in drivers DSA loudspeaker are not designed to replace subwoofers if strong, very low frequency response is needed. Boosts below 100 Hz can greatly increase the cone excursion and can use up much of the amplifier power available. These conditions can significantly reduce the overall maximum output.

6.4.4 INPUT LIMITING

The input limiting should not be used for driver protection. There is fixed, internal compression and limiting to help prevent driver damage from excessive amplifier output levels. These limiters will automatically activate in the presence of excessive signals. The LED indicator can be enabled to indicate activation of the protection circuits. See Section 6.1.2.

6.4.5 DSAPILOT ADJUSTMENTS

Do not make adjustments using DSAPilot during normal operation. The reason is that changes to the DSA loudspeaker's electronics requires successively updating all internal parameters. Because there is a complete DSP engine for each transducer, updates can take a noticeable amount of time. Also depending on the magnitude of any changes, sonic artifacts may result while the updates are taking place.

Chapter 7 - Maintenance and Service

This chapter provides information about warranty coverage and service.

7.1 Warranty

See the supplied warranty card for warranty details.

7.2 Service Items

There are no field serviceable parts for the DSA250 or DSA230. Service and repair information must be obtained by contacting the EAW Service Department or the service department of the EAW Distributor for your country. See Section 7.3 for contact information.

7.3 How to Contact EAW

We have attempted to answer any questions you may have about the DSA Series in this manual and the associated guides. Should you need further assistance, you can contact us in several different ways.

7.3.1 OPERATING QUESTIONS:

For questions about configuring or operating the loudspeakers, contact:

EAW Application Support Group
Tel 508-234-6158
Tel 800-992-5013 (USA only)
Fax 508-234-8251
e-mail asg@eaw.com

7.3.2 SERVICE INFORMATION

For questions about troubleshooting or servicing a DSA Series loudspeaker, contact:

Mail EAW Service Department
One Main Street, Whitinsville, MA 01588 USA
Tel 800-992-6001 (USA only)
Tel 508-234-6001
Fax 508-234-3776
e-mail service@eaw.com

7.3.3 LITERATURE AND SPECIFICATIONS

For literature and specifications on EAW products, contact:

EAW Literature Department
Tel 508-234-6158
Tel 800-992-5013 (USA only)
Fax 508-234-8251
Web Site http://www.eaw.com
e-mail litperson@eaw.com

7.3.4 GENERAL

For all other information:

Mail Eastern Acoustic Works
One Main Street, Whitinsville, Massachusetts 01588 USA
Phone 508-234-6158
Toll Free 800-992-5013 (USA only)
Fax 508-234-8251
Web Site http://www.eaw.com
e-mail info@eaw.com

Chapter 8 - Appendices

8.1 Inspections and Maintenance

8.1.1 PERIODIC PHYSICAL INSPECTIONS

Complete and thorough inspections should be done on a routine, periodic basis. The interval between inspections and scope of the inspections will depend on the conditions of use. This interval must not exceed 1 year.

All mountings and enclosures should be visually examined for any condition that may affect mounting integrity. A complete inspection should include, but not be limited to, looking for these types of damage to DSA Series loudspeakers and parts:

bends
breaks
broken parts
corrosion
cracks
cracks in welded joints
deformation

DANGER: Should any of the above listed types of damage exist, immediately remove the affected part from service for repair or replacement. If there is any question about the integrity or capability of any mounting or rigging part to perform its intended function, it must be immediately removed from service for repair or replacement.

8.1.2 PERFORMANCE TESTING

Listening tests and/or formal measurements should be done periodically. The interval between such tests will depend on the frequency of system usage and the conditions of use. All transducers should be tested for functionality and proper performance.

Careful listening will usually reveal transducer and/or enclosure problems in the form of distortion, buzzes, rattles, or non-function.

8.1.3 CLEANING

The sides and rear of the enclosure function as a heat sink for the internal amplifiers. Because of this, they must remain relatively free of dust and dirt to ensure good heat transfer to the surrounding air. If these surfaces need cleaning, use a vacuum and/or damp cloth to remove any dust or dirt.

CAUTION: To avoid damaging the exterior finishes do not use cleaning solvents or abrasives.

8.2 Troubleshooting

This troubleshooting table addresses some common faults. For other difficulties not listed, contact the EAW Service Department.

SYMPTOM	POSSIBLE CAUSE	SOLUTION
DSA250 Only:		
No HF output	Failed internal component	Loudspeaker needs service.
No HF output from one or more drivers	Failed internal component	Loudspeaker needs service.
DSA250 and DSA230:		
Loudspeakers connected within a cluster by the Signal Link jacks do not function	Supplied Link Cable is faulty	Check link cable for proper operation and ensure the RJ-45 connectors are fully engaged when inserted.
Loudspeakers connected within a cluster by the Signal Link jacks do not function	User-supplied link cable is incorrect	Ensure link cable is wired as a standard Ethernet crossover cable and is less than 2 ft / 0.6 m long
No LF output	Failed internal component	Loudspeaker needs service.
No LF output from one or more drivers	Failed internal component	Loudspeaker needs service.
No output	Incorrect connections	Check that input cabling to the loudspeaker is wired correctly for the +/- signal wires and cable shield.
No output	Loudspeaker is off	Check that power is supplied to the loudspeaker power cable and that the cable is connected to the loudspeaker.
No output	Loudspeaker is off	Check the fuse on the power end of the loudspeaker. Replace if blown. If the fuse blows again, the loudspeaker requires service.
No output	Amplifier is off	Using the DSAPilot, check that the power management functions are set correctly.
No output	No input signal	Using the DSAPilot monitoring function, check that there is signal at the input. If not, disconnect and check for signal on the audio input cable to the loudspeaker.
No or low output	Input level is not set correctly	Using the DSAPilot, check that the gains for the input(s) being used are set properly.
Coverage is incorrect	Improper set-up	Using the DSAPilot, ensure the desired beamwidth and aiming angle are correct.
Coverage is incorrect	Loudspeaker upside down	Using the DSAPilot to active the loudspeaker's LED indicator, ensure

		the up/down enclosure orientation is correct for the application.
Distorted sound	Failed internal component(s)	Using the DSAPilot's Service Mode, check the operation of each amplifier and driver.
Distorted sound	Excessive levels	Using the DSAPilot, monitor the DSA signal path to check for clipping at all monitoring points.
Distorted sound	Bad input signal	Use a substitute amplifier and loudspeaker to check the quality of the input signal to the DSA Series loudspeaker.
EIA-485		
No computer communication	Incorrect PC set-up	Follow the instructions in the DSAPilot Help File for setting up communications between the PC and the DSAPilot
No computer communication	Incorrect connections	Check that EIA-485 cabling to both the computer and the loudspeaker is wired correctly for the +/- signal wires and cable shield.
No computer communication	Incorrect termination	Ensure that a termination is engaged at the EIA-485 port at the computer and the Terminate Switch is "ON" at the loudspeaker at the farthest end of the EIA-485 cable run. All other Terminate Switches should be "OFF".
No computer communication	Loudspeaker is powered off	Ensure the loudspeaker is powered on.
No computer communication or only with some loudspeakers	Improper network configuration	Ensure the EIA-485 cabling and termination conforms to the notes in Section 8.3.
No computer communication with some loudspeakers	Improper link connections between loudspeakers	Ensure the EIA-485 only cabling and/or the supplied RJ-45 Signal Link Cables are connected between loudspeakers as detailed in this manual.
CobraNet™		
Audio signal or computer communication not functioning or not functioning correctly	Network cabling does not meet specification	Ensure Ethernet cabling meets IEEE 802.3u specifications for 100BASE-T networking.
Audio signal or computer communication not functioning or not functioning correctly	CM-1 Interface Card malfunctioning	Replace with a known good CM-1 Interface Card to determine if the removed card is faulty
Other CobraNet™ problems	Network or digital audio not properly implemented	Refer to either IEEE 100BASE-T or Peak Audio documentation to troubleshoot network or digital audio difficulties.

8.3 EIA-485 Network

EIA-485 network cabling has certain limitations that these notes summarize. Improper set-up of an EIA-485 network can result in faulty or no operation. To use EIA-485 network configurations or cabling schemes not addressed in this manual, consult a qualified network professional.

8.3.1 CABLING NOTES:

1. Single Loudspeaker or loudspeaker cluster:
   One end of the EIA-485 cable is connected to the computer's EIA-485 port and the other to the EIA-485 connector on the loudspeaker or on one of the loudspeakers in a cluster.

2. Multiple Loudspeakers:
   One end of the EIA-485 cable is connected to the computer's EIA-485 port. The cable is then connected daisy-chain fashion to multiple loudspeakers or clusters. This means to connect the EIA-485 cable from the computer to a loudspeaker or cluster, then to loop it to additional loudspeakers or clusters. Use the supplied RJ-45 Signal Link Cables to link loudspeakers within a cluster using the Signal Link jacks. This cable also interconnects the audio between the loudspeakers.

3. DO use an EIA-485 hub when separate EIA-485 home runs to the computer are needed because of cable routing constraints. Note: EIA-485 hubs often contain an RS-232 to EIA-485 converter.

4. DO use an EIA-485 hub to extend the length of the EIA-485 cabling beyond 1000 ft / 300 m. Literature about EIA-485 claims maximum cable lengths of 4,000 ft. However, the fastest data rates for a DSA network, assuming ideal network conditions, limit the maximum to 2,800 ft / 850 m. Performance variations for the network cable, connectors, EIA-485 drivers, and several other variables can and often do further reduce this length. Therefore, this is the maximum recommended length to ensure reliable communications.

5. DO use an EIA-485 hub to connect the EIA-485 network to more than 31 DSA Clusters. Each loudspeaker within a multi loudspeaker DSA Cluster counts as one DSA Cluster if they are all connected DIRECTLY to the EIA-485 network using the EIA-485 Phoenix connectors. If the loudspeakers within a multi-loudspeaker DSA Cluster are inter-connected via the Signal Link connectors, and thus only one is connected directly to the EIA-485 network, then this counts as only one DSA cluster.

6. DO NOT connect the EIA-485 cabling to the loudspeakers in a star fashion. This means do not home-run an EIA-485 cable from each loudspeaker or cluster to the computer.

7. DO NOT connect the EIA-485 cabling between loudspeakers in a star fashion. This means do not run an EIA-485 cable from one loudspeaker or cluster to more than one other loudspeaker or cluster.

8. DO NOT connect loudspeakers or clusters in a "stub" fashion. This means do not connect a branch cable off an EIA-485 cable to run to a loudspeaker or cluster.

9. DO NOT connect the far end of the EIA-485 cable back to the computer. This means do not make an electrically closed loop for the EIA-485 cabling.

8.3.2 TERMINATION NOTES:

1. The DSA Terminate Switch connects a 120 ohm resistor as a load on the EIA-485 cabling.
2. Normally, USB to EIA-485 or RS-232 to EIA-485 converters also have a termination resistor connected as a load on the computer end of the EIA-485 cabling. If optional, this termination should be switched on. Both this termination resistor and the one in the loudspeaker at the far end of the EIA-485 cabling from the computer are required to ensure proper network operation.
3. Due to inherent current limitations, the load resistance on EIA-485 hardware must be greater than 50 ohm. This means only ONE loudspeaker Terminate Switch can be "ON" on the EIA-485 network along with the converter's termination resistor. If more than one loudspeaker Terminate Switch is "ON", the network can experience intermittent or non-existent communications. Additional terminations needlessly draw more power from the RS-485 converters, reducing signal strength.
4. The Terminate Switch only works for the EIA-485 cable connection at the Phoenix Contact connector. The Terminate Switch does not work for EIA-485 connections between loudspeakers using the Signal Link connectors. Therefore, use the Terminate Switch only on the loudspeaker within a cluster that is connected to the network via the Phoenix connector.

8.4 Support For Ethernet

The infrastructure for a CobraNet™ network must be designed and built using standard IEEE 802.3u 100BASE-T Ethernet network hardware. As this is a standardized technology, EAW does not provide technical support for Ethernet networking. Standards and technical documentation for the design, set-up, operation, and troubleshooting of 100BASE-T Ethernet networks are available from a variety of sources on the Internet.

8.5 Support For CobraNet™

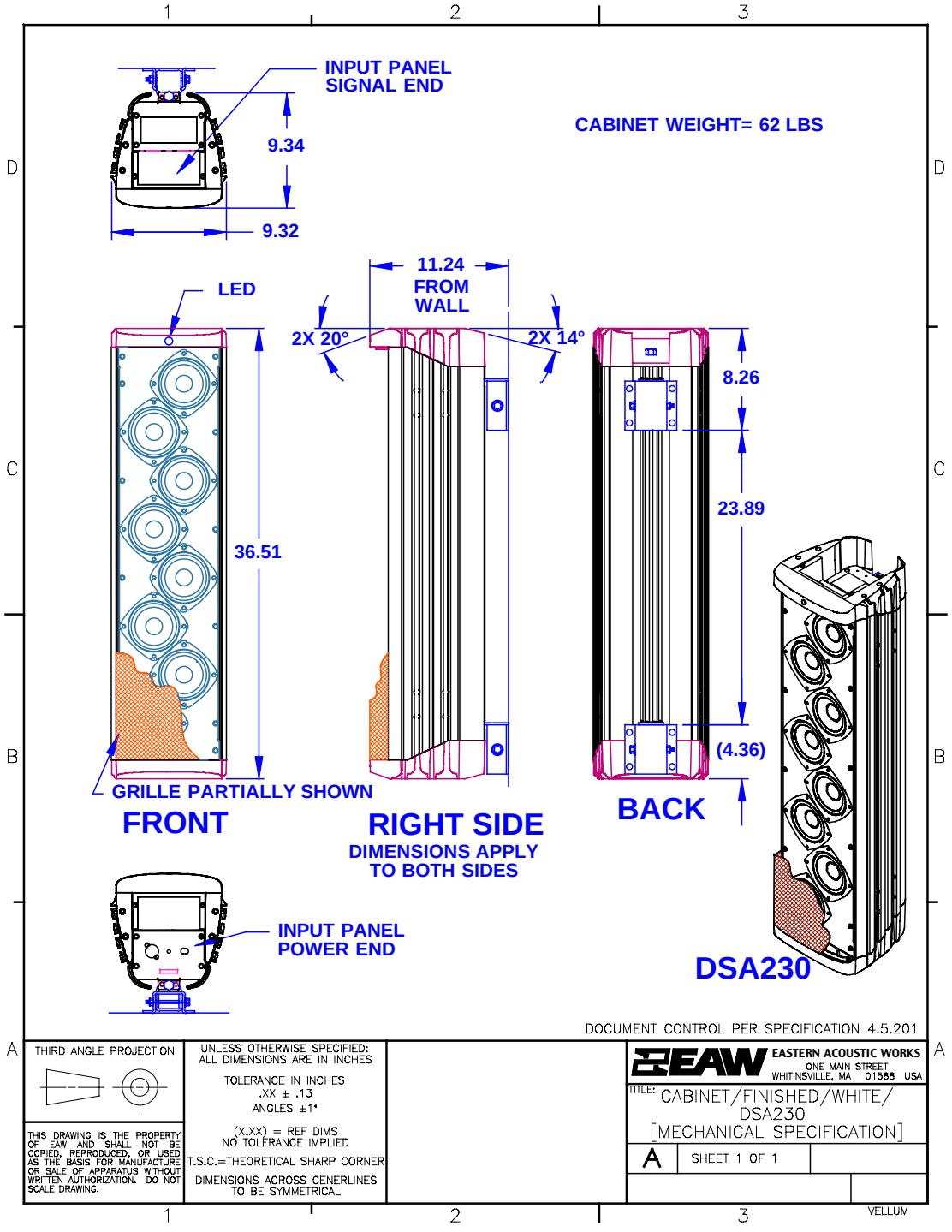
CobraNet™ technology relies on specific and exacting network timing issues to deliver digital audio to its destination intact and with no dropouts. As such, there are certain limitations to how an Ethernet network for CobraNet™ can be designed. For specific information about designing a CobraNet™-compliant network, contact:

Peak Audio (A Division of Cirrus Logic)
305 Interlocken Parkway
Broomfield, CO 80021-3484
Phone: 303-466-5228
Fax: 303-464-6776
E-Mail: info@peakaudio.com
Web: http://www.peakaudio.com

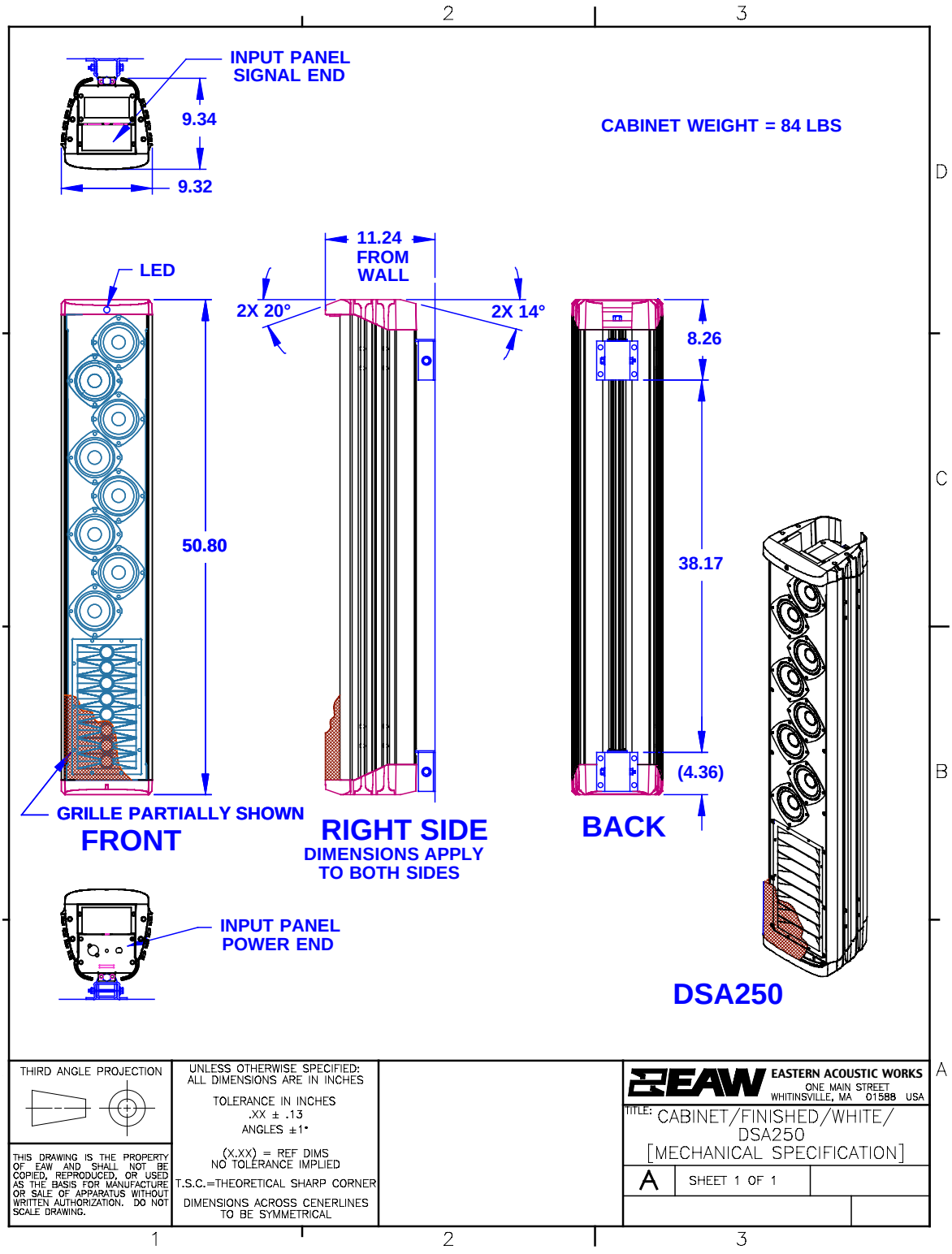
NOTE: Peak Audio's web site provides, on-line information about designing an Ethernet network that complies with CobraNet™ requirements. It also provides links to information about Ethernet technology.

Chapter 9 - Mechanical Drawings

9.1 DSA230



9.2 DSA250


INPUT PANEL
SIGNAL END
9.34
9.32
CABINET WEIGHT = 84 LBS
LED
11.24
FROM
WALL
2X 20°
2X 14°
8.26
50.80
38.17
(4.36)
GRILLE PARTIALLY SHOWN
FRONT
RIGHT SIDE
DIMENSIONS APPLY
TO BOTH SIDES
BACK
INPUT PANEL
POWER END
DSA250
THIRD ANGLE PROJECTION
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UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES
TOLERANCE IN INCHES
.XX ± .13
ANGLES ±1°
(X.XX) = REF DIMS
NO TOLERANCE IMPLIED
T.S.C.=THEORETICAL SHARP CORNER
DIMENSIONS ACROSS CENERLINES
TO BE SYMMETRICAL
EAW EASTERN ACOUSTIC WORKS
ONE MAIN STREET
WHITINSVILLE, MA 01588 USA
TITLE: CABINET/FINISHED/WHITE/
DSA250
[MECHANICAL SPECIFICATION]
A
SHEET 1 OF 1

9.3 WALL BRACKET

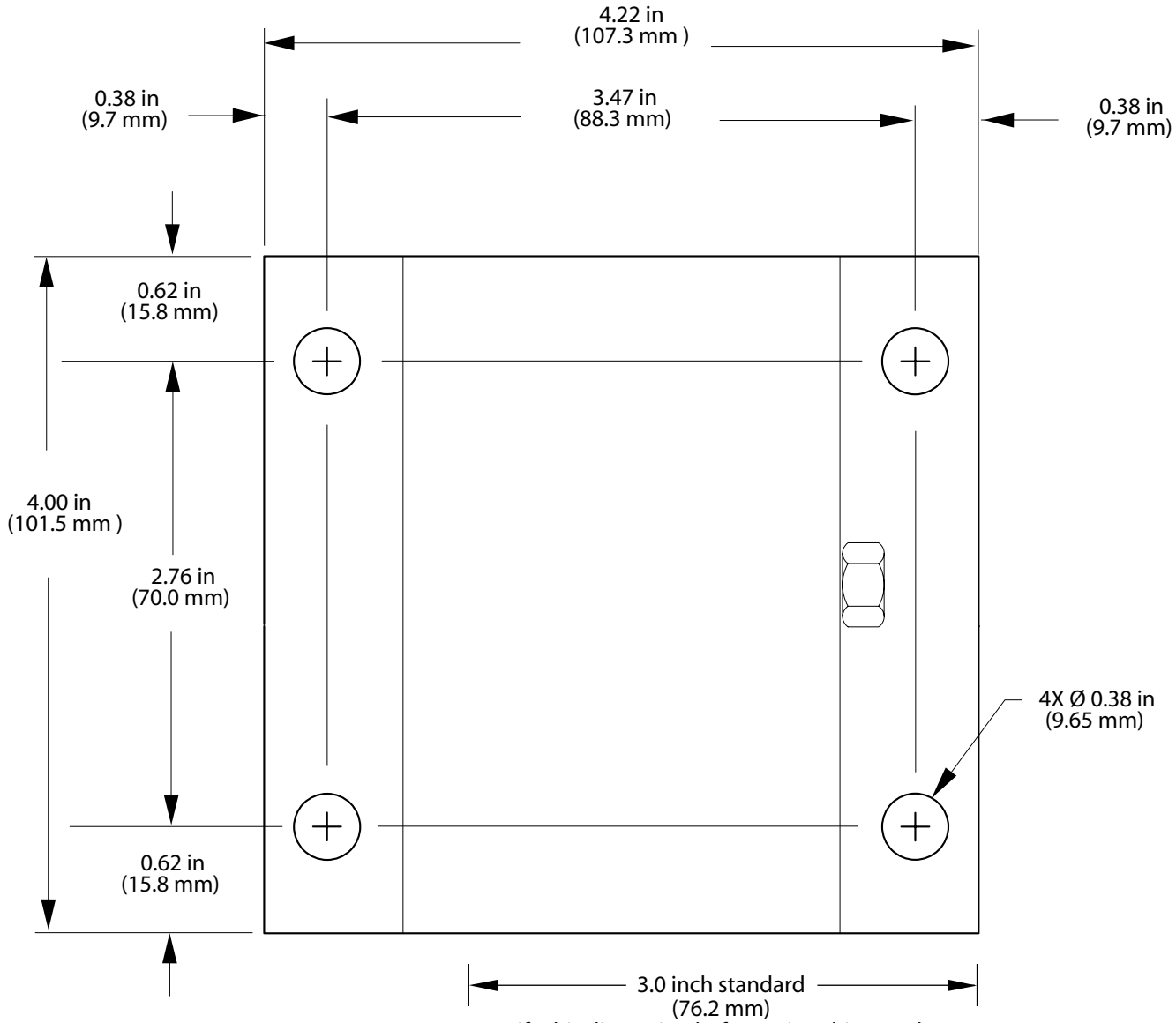

FIGURE 9.3 WALL BRACKET (FULL SCALE)

See Section 5.5.7 for Mounting Instructions

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